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09/670,157	09/26/2000	Rajesh Sundaram	205514	4843

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EXAMINER	
STRANGE, AARON N	
ART UNIT	**PAPER NUMBER**
2153	

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3

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/670,157	SUNDARAM ET AL.	
	Examiner	Art Unit	
	Aaron Strange	2153	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 March 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 7, 8 and 19 are objected to because of the following informalities:

   a. Claims 7 and 8 appear to contain a typographical error --- comparing of a field --- in line 1 of each claim.

   b. Claim 19 appears to contain a typographical error --- an identify of – in lines 2 and 3.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1,2,5,6,9, and 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay and Delay Variation on the Internet).

4. With regard to claim 1, Graham et al. disclose a method for calculating jitter of a packet flow comprising: accessing data collected on the sending computer (information is sent to analysis site)(Page 2, Lines 12-13), said data comprising identifiers of a plurality of packets sent by the program along with timestamps representing the times of transmission of the sent packets (Page 3, Lines 7-9); accessing data collected on the receiving computer (information is sent to analysis site)(Page 2, Lines 12-13), said data

comprising identifiers of a plurality of packets received from the network along with timestamps representing the times of reception of the received packets (Page 3, Lines 7-9); associating, through the use of the sent and received packet identifiers, at least some of the sent packets with the received packets (Page 3, Lines 35-38) ; and calculating jitter as the variation in the difference between the reception and transmission timestamps of associated packets (Page 4, Line 41 to Page 5, Line 5).

5. With regard to claim 2, Graham el al. further disclose that associating and calculating overlap in time with accessing data collected on the sending and receiving computers (Page 3, Lines 21-23).

6. With regard to claim 5, Graham et al. further disclose that accessing data collected on the sending and receiving computers comprises sending said data to a computer other than the sending and receiving computers (monitoring stations send information to a single analysis site) (Page 2, Lines 12-13).

7. With regard to claim 6, Graham et al. further disclose that associating comprises comparing a field identifying the packet flow (descriptor) (Page 2, Line 42 to Page 3, Line 9) in the sent and received packet identifiers and comparing a field identifying the packet in the sent and received packet identifiers (CRC) (Page 3, Lines 35-38).

8. With regard to claim 9, Graham et al. further disclose that associating at least some of the sent packets with received packets comprises noting as lost in transmission sent packets which are not associated with received packets (Page 4, Lines 6-8).

9. With regard to claim 16, Graham et al. further disclose that calculating jitter comprises correcting for jumps (offset) in the clocks on the sending and receiving computers (Page 3, Lines 15-18).

10. With regard to claim 17, Graham et al. further disclose that calculating jitter comprises correcting for skew between the clocks (drift) on the sending and receiving computers (Page 3, Lines 15-18).

11. With regard to claim 18, Graham et al. further disclose a computer readable medium containing instructions for performing the method of claim 1. Since the method of claim 1 is executed on computers (Page 2, Lines 12-13), instructions for performing said method must be located on a computer readable medium or the computers would not be able to read the instructions to perform the method.

12. With regard to claim 19, Graham et al. disclose a computer readable medium having a data structure comprising: a first data field containing data representing an identifier of a packet flow (descriptor) (Page 2, Line 42 to Page 3, Line 9); a second data field containing data representing an identifier of a packet transmitted in the packet flow (CRC) (Page 3, Lines 35-38); a third data field containing data representing a time of transmission of the packet (Page 3, Lines 7-9); and a fourth data field containing data representing a time of reception of the packet (each station records timestamp)(Page 3, Lines 7-9 and Lines 35-38). Since the method of claim 1 is executed on computers (Page 2, Lines 12-13), instructions for performing said method must be located on a computer readable medium or the computers would not be able to read the instructions to perform the method.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 3,4,8,10,11,20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay and Delay Variation on the Internet).

15. With regard to claim 3, while the system disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose that accessing data collected on the sending computer comprises sending said data to the receiving computer.

Graham et al. disclose that the monitoring stations send information to a single analysis site (Page 2, Lines 12-13), but remain silent regarding any limitations of the analysis site. It is clear that the location of the analysis site is not critical to the functionality of the system. The analysis site simply correlates the collected data and calculates delay and jitter measurements (Page 3, Lines 35-38). It would be advantageous to allow the receiving computer to act as the analysis site and receive the data since it would eliminate the need for a dedicated computer used for associating and calculating jitter for the data.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to send the data collected on the sending computer to the

receiving computer. This eliminates the need for an additional station dedicated to associating and calculating jitter for the data, reducing costs for the measurement system.

16. With regard to claim 4, while the system disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose that accessing data collected on the receiving computer comprises sending said data to the sending computer.

Graham et al. disclose that the monitoring stations send information to a single analysis site (Page 2, Lines 12-13), but remain silent regarding any limitations of the analysis site. It is clear that the location of the analysis site is not critical to the functionality of the system. The analysis site simply correlates the collected data and calculates delay and jitter measurements (Page 3, Lines 35-38). It would be advantageous to allow the sending computer to act as the analysis site and receive the data since it would eliminate the need for a dedicated computer used for associating and calculating jitter for the data.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to send the data collected on the receiving computer to the sending computer. This eliminates the need for an additional station dedicated to associating and calculating jitter for the data, reducing costs for the measurement system.

17. With regard to claim 8, while the system disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose that

comparing a field identifying the packet comprises comparing an IP ID assigned to the packet. Graham et al. disclose the use of a CRC signature to uniquely identify the packets. However, Graham et al. acknowledge that problems could occur if a significant number of packets with the same payload CRC occurred on the network within the delay time.

The standard IP identifier located in the header of an IP packet is a 16-bit uniquely assigned number given to the packet by the sending station. The sending station consecutively numbers each packet as it is sent. By using a sliding window protocol, the receiving station can essentially eliminate all packets having duplicate identifiers. This ensures that all received packets can be uniquely matched to a sent packet. An additional benefit of using the IP identifier to identify packets is the ability to determine if packets arrive out of order. Since the packets are sequentially numbered as they are sent, they should be received sequentially.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the IP identifier as the means for uniquely identifying packets. This ensures that duplicate identifiers can be differentiated by using a sliding window as well as allowing the receiving station to easily determine when packets arrive out of order.

18. With regard to claim 10, while the system method disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose that associating at least some of the sent packets with received packets

comprises using the received packet identifiers to reorder the data collected on the receiving computer into the order in which the received packets were sent.

However, since jitter is calculated as the difference between the reception and transmission timestamps of associated packets, it would be advantageous to reorder the packets into the order in which they were sent. The sending computer would already have the packets in sequential order, so associating them would be simpler if the received packets were also placed in sequential order. By having both sets of packets in order, the jitter calculation could be quickly performed sequentially by traveling down the data set and calculating the delay between each matched pair of successive packets. By using the IP identifier discussed regarding claim 8, this reordering would be simple and relatively fast.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reorder the data collected on the receiving computer into the order in which the received packets were sent. This would allow the calculation of jitter to be much faster since the associated receive timestamps would be easier to find and would not require searching the entire list. This could save a significant amount of time for large data sets.

19. With regard to claim 11, as discussed regarding claim 10, reordering comprises comparing a rollover component of the received packet identifiers (IP identifier rolls over).

20. With regard to claim 20, while the system disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose that

the second field comprises a fifth field containing data representing an IP ID assigned to the packet. Graham et al. disclose the use of a CRC signature to uniquely identify the packets. However, Graham et al. acknowledge that problems could occur if a significant number of packets with the same payload CRC occurred on the network within the delay time.

The standard IP identifier located in the header of an IP packet is a 16-bit uniquely assigned number given to the packet by the sending station. The sending station consecutively numbers each packet as it is sent. By using a sliding window protocol, the receiving station can essentially eliminate all packets having duplicate identifiers. This ensures that all received packets can be uniquely matched to a sent packet. An additional benefit of using the IP identifier to identify packets is the ability to determine if packets arrive out of order. Since the packets are sequentially numbered as they are sent, they should be received sequentially.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the IP identifier as the means for uniquely identifying packets. This ensures that duplicate identifiers can be differentiated by using a sliding window as well as allowing the receiving station to easily determine when packets arrive out of order.

21. With regard to claim 22, while the system disclosed by Graham et al. shows substantial features of the claimed invention, it fails to disclose that the data structures are sorted into the order of the times of transmission.

However, since jitter is calculated as the difference between the reception and

transmission timestamps of associated packets, it would be advantageous to reorder the packets into the order in which they were sent. The sending computer would already have the packets in sequential order, so associating them would be simpler if the received packets were also placed in sequential order. By having both sets of packets in order, the jitter calculation could be quickly performed sequentially by traveling down the data set and calculating the delay between each matched pair of successive packets. By using the IP identifier discussed regarding claim 19, this reordering would be simple and relatively fast.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reorder the data collected on the receiving computer into the order in which the received packets were sent. This would allow the calculation of jitter to be much faster since the associated receive timestamps would be easier to find and would not require searching the entire list. This could save a significant amount of time for large data sets.

22. Claims 7 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay and Delay Variation on the Internet) in view of RFC 2391.

23. With regard to claim 7, Graham et al. further discloses that comparing a field identifying the packet flow comprises comparing a sender IP address, a receiver IP address, and a protocol identifier (Page 2, Line 41 to Page 3, Line 1). However, Graham et al. fail to disclose the comparison of sender and receiver ports.

RFC 2391 discloses that TCP/UDP sessions are uniquely identified by the tuple of source/destination IP address, and source/destination port identifiers (page 4, Lines 4-6). Since TCP/UDP sessions require port identifiers to be uniquely identified, it would be advantageous to compare these parameters in addition to the source/destination IP address for TCP/UDP sessions. This allows jitter to be calculated for individual packet flows between applications in the event that multiple packet flows between the same source/destination pair are in progress simultaneously.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to compare the sender/receiver ports in addition to the addresses and protocol identifier. This allows packet flows to be uniquely identified and will allow data to be collected for a particular packet flow in the event that multiple flows between the same source/destination pair are in progress simultaneously.

24. With regard to claim 21, Graham et al. further disclose that this first field comprises: a fifth field containing data representing a sender IP address of the packet flow; a seventh field containing data representing a receiver IP address of the packet flow; and a ninth field containing data representing a protocol identifier of the packet flow (Page 2, Line 41 to Page 3, Line 1). However, Graham et al. fail to disclose a sixth field containing data representing a sender port of the packet flow or an eighth field containing data representing a receiver port of the packet flow.

RFC 2391 discloses that TCP/UDP sessions are uniquely identified by the tuple of source/destination IP address, and source/destination port identifiers (page 4, Lines 4-6). Since TCP/UDP sessions require port identifiers to be uniquely identified, it would

be advantageous to compare these parameters in addition to the source/destination IP address for TCP/UDP sessions. This allows jitter to be calculated for individual packet flows between applications in the event that multiple packet flows between the same source/destination pair are in progress simultaneously.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add fields for the sender receiver ports to compare the ports in addition to the addresses and protocol identifier. This allows packet flows to be uniquely identified and will allow data to be collected for a particular packet flow in the event that multiple flows between the same source/destination pair are in progress simultaneously.

25. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay and Delay Variation on the Internet) in view of Dickens (US 5,806,063).

26. With regard to claim 12, while the system disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose that reordering comprises imposing a window on the range of possible values of the rollover component of the received packet identifiers and reordering only the data the values of whose rollover component are within the window.

Since the data collected has a rollover component (IP identifier), sorting it requires a different method than usual. Due to the existence of the rollover component, 0 is not necessarily the smallest packet identifier since the first packet sent usually does

not have 0 as an identifier. Dickens teaches imposing a window on the range of possible values of the rollover component of a 2-digit date and reordering only the data whose rollover component falls within the window. By using a window, special treatment can be given to data within that window. In the system disclosed by Dickens, data on each side of the rollover point is treated differently. Dates after the rollover point are treated as higher than dates prior to the rollover point, disregarding the numerical values. A date in 01 (2001) will be treated as after a date in 99 (1999) despite 99 being larger than 1. This method of sorting around a rollover point would be equally effective in sorting packets based upon their identifiers. Since the sending station sequentially issues identifiers, they are effective as dates for the purpose of sequential ordering of packets.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to impose a window on the range of possible values of the rollover component of the received packet identifiers and reorder only the data the values of whose rollover component are within the window. This allows packets to be properly sorted into sequential order when the rollover component has rolled over, as shown in the system disclosed by Dickens.

27. With regard to claim 13, while the system disclosed by Graham et al. in view of Dickens shows substantial features of the claimed invention (discussed above), it fails to disclose that reordering comprises imposing a window that is smaller than the range of possible values of the rollover component of the received packet identifiers,

reordering only the data the values of whose rollover component are within the window, and moving the window throughout the range until all of the data are reordered.

However, using a window which is smaller than the range of possible values of the rollover component of the packet identifiers allows the majority of the data to be sorted without worrying about the rollover value. Only once the window has moved to include the rollover value will the sorting algorithm need to be modified in order to accommodate the values on each side of the rollover. This will speed up the sorting process and allow the association process to begin sooner.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to impose a window that is smaller that the range of possible values of the rollover component of the received packet identifiers and reorder only the data the values of whose rollover component are within the window, and move the window throughout the range until all of the data are reordered. This allows most of the list to be sorted without concern of the rollover value, speeding up the sorting process.

28. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay and Delay Variation on the Internet) in view of Tanenbaum.

29. With regard to claim 14, while the system disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose that associating comprises imposing a window on the range of possible values of the

rollover of the received packet identifiers and searching for a received packet identifier to match a sent packet identifier only among those data the values of whose rollover component are within the window.

Tanenbaum discloses several variations of sliding window protocols. In all sliding window protocols, a sender in a sliding window protocol maintains a window of packets that have not yet been acknowledged at any one time (Page 203, Line 33 to Page 204 Line 10). If an acknowledgment is not received after a predetermined time period, the sender can detect the missing slot in the window and will retransmit the original frame. The acknowledgement must be received before advancing the window past the missing slot. This method of detecting whether an acknowledgment is missing or not would work equally well for searching for a received packet identifier to match a sent packet identifier, since the frames have already been sequentially sorted. Once a packet has been matched, there is no value to searching it again since it will not match any more frames. Using a window will limit the size of the area being searched as it advances past the matched bits, speeding up the search process since fewer elements have to be searched to find a match.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to comprises impose a window on the range of possible values of the rollover of the received packet identifiers and search for a received packet identifier to match a sent packet identifier only among those data the values of whose rollover component are within the window. This would speed up the process of searching for a match since the packets have already been sorted by transmission time,

and if a packet is found which was transmitted after the packet being searched for, then the missing packet can be assumed to be lost in transmission.

30. With regard to claim 15, while the system disclosed by Graham et al. shows substantial features of the claimed invention (discussed above), it fails to disclose a window that is smaller than the range of possible values of the rollover component of the received packet identifiers and move the window throughout the range until all sent packets are either associates with received packets or are noted as lost in transmission.

A smaller window makes it easier to find matching packets since there are less packets to search through. The window only needs to be large enough to cover the possible locations where a match could be found. Since the packets have been sorted already, a match will not be found before the last matched packet or after a packet that was transmitted after the packet for which a match is desired. If a match is not located within the window where it belongs, it can be assumed to be lost in transmission. Utilizing the window reduces the range of data that must be searched, speeding up the association process.

Therefore, it would have been further obvious to one of ordinary skill in the art at the time the invention was made to use a window which is smaller than the range of possible values of the rollover component and move the window throughout the range until all packets are either associated or noted s lost in transmission. A smaller window reduces the amount of data that must be searched to find a matching packet, speeding up the association process.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron Strange whose telephone number is 703-305-8878. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glen Burgess can be reached on 703-305-4792. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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